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THE MONTANA ELK HUNTING EXPERIENCE:

A Contingent Valuation Assessment of Economic Benefits to Hunters

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THE MONTANA ELK HUNTING EXPERIENCE:

A CONTINGENT VALUATION ASSESSMENT OF ECONOMIC BENEFITS TO HUNTERS

Prepared for
Montana Department of Fish, Wildlife and Parks

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September 1988

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EXECUTIVE SUMMARY

The net economic value of elk hunting in Montana was estimated using both the open-ended and dichotmous choice Contingent Valuation Methods. This technique was applied to a majority of elk hunting areas in Western Montana. For the Fall 1986 season the net willingess to pay for the current elk hunting conditions was $262 per trip or $39.90 per hunter day. If the chances of harvesting a six-point bull elk were to double, the value would be expected to rise to $345 per trip. The value of elk hunting in the areas studied in Montana would not change significantly if the number of other elk hunters seen dropped in half. This may be due to the fact that Montana elk hunters saw very few other hunters during their nearly week long trips.

Values are reported for each of five Montana Department of Fish, Wildlife and Parks Administrative Regions, as well as for 18 Hunt Areas in Western Montana. These Hunt Areas represent nearly 70 Hunt Districts. Values in all Regions exceeded $200 per trip.

The net economic value of hunting was also estimated by hunter type. Specifically, hunters can be grouped according to their motivations for hunting and the type of elk hunting experience they prefer. Four distinct hunter types were identified. The value of elk hunting varied from as little as $164 per trip to as much as $360 per trip between these groups. Willingness to pay for doubling chances of harvesting a six-point or larger bull elk varied between the groups.

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CHAPTER I

INTRODUCTION

Study Purpose

This report presents an evaluation of the qualitative dimensions of elk hunting in selected areas in Montana. The primary purpose is to investigate how the role of hunter motivations and preferences for different hunting experiences influence the satisfaction and economic value received by persons hunting elk in Montana. Specific qualitative dimensions evaluated include the economic value to the hunter of doubling his chances of harvesting a six-point or larger bull elk, and of seeing one-half the number of elk hunters. In addition, since the number of observations for each Hunting Area was two to ten times as large as in the baseline elk hunting report, Hunt Area specific values are provided to value current hunting conditions in Hunt Areas sampled. However, not all elk hunting areas in Montana were analyzed. The values for the Hunt Areas analyzed may be of use to planners and economists in performing site specific analyses.

The primary contribution from analysis of this data set as compared to the baseline elk hunting lies in two areas:

(1) Change in elk hunter benefits associated with harvesting six-point or larger bull elk and benefits of reduced congestion in Hunt Areas, and

(2) Estimation of benefits of elk hunting stratified by the type of hunter and his motivation for elk hunting. This latter stratification is referred to as hunters classified into "preference clusters" based on the hunters' responses to a set of questions designed to measure their motivations for hunting and preferences regarding the natural setting and hunting regulations.

Elk hunting benefits are estimated at the State level, for five Regions and for 18 Hunt Areas in Western Montana for three scenarios: current conditions, doubling chances of bagging a six-point or larger bull elk and reducing congestion. In addition, elk hunting benefits by elk hunter type are presented at the State level.

Definition of Economic Benefits

Many Federal agencies are required by U.S. Water Resources Council Principles and Guidelines (1983) to use the concept of net willingness to pay to measure the economic value of both marketed goods (e.g., agricultural commodities, hydropower, etc.)

and non-marketed resources (e.g., recreation) in Benefit Cost Analysis or evaluation of Federal actions. When performing natural resource damage assessments, the U.S. Department of Interior regulations require that the calculation of economic values gained (or lost) to society be measured in terms of net willingness to pay (U.S Department of Interior, 1986). The Bureau of Land Management (1982) also uses net willingness to pay as a measure of economic benefits of wildlife and other resources when performing benefit cost analysis. Use of the net willingness to pay criteria is also recommended in textbooks on Benefit Cost Analysis (Sassone and Schaffer, 1978; Just, Hueth and Schmitz, 1982). While willingness to accept compensation rather than willingness to pay should be used for valuing losses, many Federal agencies use the more conservative measure of willingness to pay.

To quantify economic value requires measurement of an individual's maximum willingness to pay for elk hunting in Montana. The concept of net willingness to pay can be explained by way of illustration using Figure 1. This figure illustrates a hypothetical demand curve of a Montana elk hunter. This curve shows the visitor would pay $50 for the first trip, $35 for the second trip, $25 for the third trip, and $10 for the fourth trip. If elk hunting costs $10 in terms of transportation costs, then the demand curve indicates that only four trips will be taken. That is, in deciding how many times to visit, the visitor compares the amount they are willing to pay with the amount they must pay. As long as the amount they are willing to pay exceeds the amount they must pay, the consumer receives a net benefit or "profit" from visiting. When the profit from visiting becomes negative (as it would on the fifth visit which is worth only $5 but costs $10) the recreationists stops visiting.

The profit or "consumer surplus" is the difference between what they are willing to pay and what they must actually pay. In Figure 1, the net willingness to pay to be able to elk hunt at a particular hunt district in Montana equals the area under the demand curve but above the cost per trip of $10. The net willingness to pay in Figure 1 is $105 (45 + 32.50 + 20 + 7.5) and the actual expenditures equals $40. The average willingness to pay per trip is $26.25 and the average expenditure is $10 per trip in this hypothetical example.

FIGURE 1

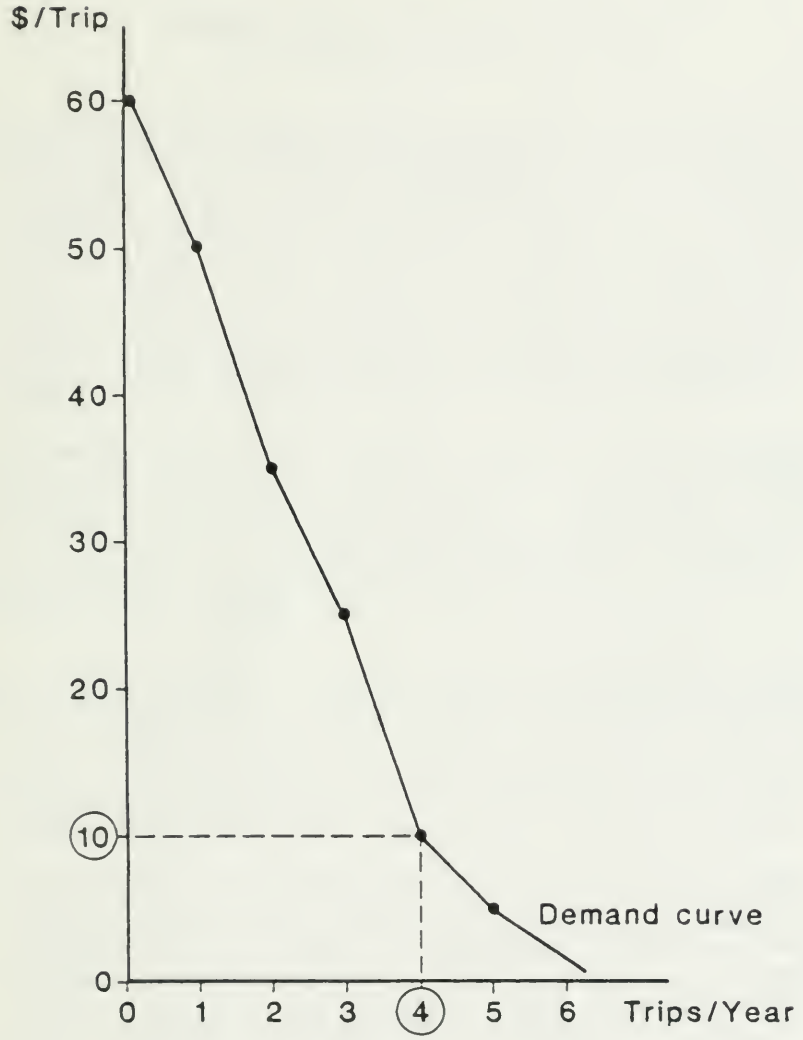


Figure 1. Hypothetical Demand Curve for Elk Hunting.

CHAPTER II

MEASUREMENT OF NET WILLINGNESS TO PAY: THE CONTINGENT VALUATION METHOD

The class of techniques referred to as the Contingent Value Method (CVM) are commonly used techniques to empirically measure willingness to pay for elk hunting under current and improved conditions. CVM is a widely accepted method for valuing both recreation and other nonmarketed benefits of environmental resources in general and recreation in particular (see Cummings, Brookshire and Schulze, 1986 for a review of CVM). CVM has been recommended twice by the U.S. Water Resources Council (1979, 1983) under two different Administrations as one of two preferred methods for valuing outdoor recreation in Federal benefit cost analyses. Recently, the U.S. Department of Interior (1986) endorsed CVM as one of the two preferred methods for valuing natural resource damages.

The basic notion of CVM is that a realistic but hypothetical market for "buying" use and/or preservation of a nonmarketed natural resource can be described to an individual. Then the individual is told to use the market to express their valuation of the resource. Key features of the market include: (1) description of the resource being preserved; (2) means of payment (often called payment vehicle) and (3) the value elicitation procedure.

The means of payment must be realistic and emotionally neutral for the respondent. To improve realism, the payment vehicle should be appropriate for the resource and market constructed. In this study of Montana elk hunting the payment vehicle used was an increase in elk hunting trip cost. This payment vehicle fulfills the requirement of being emotionally neutral (as compared to increases in elk hunting license fees) and is certainly believable given the changes in gasoline costs.

The value elicitation procedure can be one of three types. First, there are open-ended willingness to pay questions (sometimes aided with a payment card listing alternative dollar amounts), that simply ask the respondent to state the maximum increase they would pay. Another procedure is the close-ended "iterative bidding" type question where the interviewer states a dollar amount and the respondent answers yes he or she would pay or no he or she will not pay. If a yes is elicited, the amount is raised and this process repeated until a no recorded.

More recently a close-ended dichotomous choice approach to Contingent Valuation has been developed (Bishop and Heberlein, 1979; Hanemann; 1984). The dichotomous choice approach is much

like the first round of an iterative bidding sequence. Specifically, the elk hunter is asked if he or she would continue to visit the site if the trip costs increased by $X, where the dollar amount ($X) is varied among hunters in the sample. In this case, the first yes or no answer is recorded and the questioning stops. How the analyst obtains estimates of maximum willingness to pay from dichotomous choice CVM questions will be explained in more detail below. The dichotomous choice approach will be also explained more below. In this study the open-ended and dichotomous choice approaches rather than iterative procedure was used. This was partly due to the choice of a mail survey which makes iterative bidding impractical.

Validity and Reliability of CVM

Of course, some people might question the accuracy of answers to simulated markets as compared to real markets where cash actually changes hands. Would people really pay the dollar amounts they state in these surveys? The empirical evidence to date indicates that when asking willingness to pay (rather than willingness to accept), that people would pay approximately what they state in the surveys. This conclusion is based on several comparisons of real cash markets with simulated markets used in Contingent Valuation. One study of the benefits of improving air quality in the Los Angeles basin compared the hedonic property value approach to the Contingent Value Method. The comparison was between housing price differentials in areas of the Los Angeles basin with less air pollution and how much people said they would pay for the same reduction in air pollution. The study by Brookshire et al., (1982), showed that stated willingness to pay for a reduction in pollution was statistically less than what people had actually paid.

The second series of CVM validity experiments were carried out by Bishop and Heberlein (1979) and Welsh (1986) in Wisconsin. In the Bishop and Heberlein study, they compared how much goose hunters said they would pay for a goose hunting permit with the amount of cash a similar group of goose hunters actually accepted for their goose hunting permits. The actual cash value of the goose hunting permit was $63 while the stated willingness to pay was $21.

In more recent work on deer hunting permits, the Wisconsin Department of Natural Resources allowed Welsh (1986) to buy and sell up to 75 deer permits. Two markets were set up to sell permits. One was a real market where hunters were given a price and asked if they would buy at that price. The other was a Contingent Value market where the same price was quoted but the transaction did not involve real money and no permits traded hands. The results indicate the Contingent Value market

obtained values that were generally 25% higher than the actual cash values (Welsh, 1986).

Research on reliability of CVM by Loomis (1988) indicates there is no statistical difference between an individual's initial willingness to pay to preserve Mono Lake and his willingness to pay nine months later. Test-retest correlations relating an individual's willingness to pay to preserve Mono Lake in the two periods showed a statistically significant relationship.

The essence all of these comparisons of real markets to simulated markets of CVM is that respondents do attempt to give their true value of the resource. The behavior exhibited and statements of value appear to sometimes understate the value and, in other cases, to slightly overstate the value. The degree of overstatement, when it occurs, seems to be reasonably small.

Based on these studies, it appears that one can have some confidence that statement of willingness to pay elicited in Contingent Value surveys bears a close resemblance to the behavior that would be observed if the situation described in the survey arose in a real market.

Estimation of Willingness to Pay Using Dichotomous Choice CVM

Unlike responses to open-ended willingness to pay questions, which yield a continuous variable for which a simple mean can be used as the expected value of willingness to pay of the sample, analysis of dichotomous choice data is more complex. The complexity of analysis may be viewed as acceptable because of the advantages of using dichotomous choice CVM questions. In particular, dichotomous choice questions resemble a more familiar market setting as compared to open-ended contingent valuation questions. Much like a market, the dichotomous choice question simply requires the elk hunter to indicate whether they would buy or not buy the particular elk hunting trip at the new price.

Several of the concerns that some economists and social psychologists have had with directly asking willingness to pay or eliciting willingness to pay via a bidding process are avoided using the dichotomous choice approach. The first advantage of dichotomous choice is that non-response to the willingness to pay question is greatly reduced. It is more likely that respondent can indicate that an elk hunting trip was worth $X more or not, rather than trying to state that the elk hunting trip was worth exactly $W more. Secondly, any incentive for understating or overstating willingness to pay that might occur in an open-ended or bidding approach is avoided. Kriesel and Randall (1986) have shown that dichotomous choice CVM questions make truth telling the best strategy for the respondent. To see this consider the following example. The

elk hunter is asked if he would continue hunting at Site A if the cost were $100 more. If the hunter values hunting at Site A by at least a $100 more than current costs, then he will say yes, if not he will say no. There is little opportunity to misrepresent his preferences. If he said no when in fact he does value elk hunting at that site in excess of $100 more, then he would be foregoing the more valuable elk hunting in favor of the less valuable $100. After a little reflection by the elk hunter he sees his best strategy is to truthfully report his decision.

A concern some people have when they first hear a dichotomous choice question is: Well yes, the hunter said he would pay $50, but he would probably tell you he would have paid $150 if only you would have asked. How are you going to estimate maximum willingness to pay when all you know is the dollar amount they said yes to? The answer to this question is that economists can statistically infer maximum willingness to pay from these yes-no responses by use of a logit equation. For example, a sample of 200 hunters might be divided into 20 groups, each of which would receive a different dollar amount. For simplicity assume the first group is asked to pay $10 more, the next group asked to pay $20 more, and so on up to the 20th group which is asked to pay $200 more. The law of demand being what it is, a high percentage of elk hunters asked to pay $10 more would say yes. A very low percentage of elk hunters asked to pay $200 more would say yes. If we interpret these percentages as probabilities that any a sampled hunter would respond yes or no to a given dollar amount, one can calculate the mean willingness to pay of the sample by means of the expected value. Basic statistics teaches us that the mean of a sample and the expected value are the same thing. The mean is just a short cut to calculating the expected value when certain assumptions hold. In this case, we must actually compute expected value. Intuitively, the sample expected value of willingness to pay is equal to the sum of the product of each Bid amount times the associated probability that a sampled hunter would pay that bid amount.

To make this approach a bit more tangible, consider the estimation approach and calculation of expected willingness to pay as two steps. In the first step, a logistic regression is run between probability of a yes would pay $X response as the dependent variable and the amount ($X) as the independent variable. Once this logit curve is estimated, the area under that curve is the expected willingness to pay. A concrete example using one of the elk units studied will be provided in the results section to further clarify the dichotomous choice approach. The reader desiring a more step by step explanation of the dichotomous choice CVM approach should see Loomis (in press).

CHAPTER III

APPLICATION OF CVM TO MONTANA ELK HUNTING

Data Sources

The sampling frame for the analysis was a list of resident and nonresidents who had purchased big game combination license, elk hunting tags or nonresident combination licenses for the Fall 1986 season. The basic approach of Dillman's (1978) Total Design Method was used to develop the survey instrument and perform the mailing procedures. The questionnaire was in booklet form, and a postage paid return envelope was enclosed. One week after the survey, a reminder postcard was sent encouraging hunters to return the survey. Two weeks later, a follow up cover letter and second copy of the survey booklet were sent to hunters that had not responded.

A total of 8,000 hunters were sampled or approximately 8% of people with these types of licenses. Of the 8000 there were 150 undeliverables, resulting in a net sample of 7850. A total of 5171 questionnaires were returned for a response rate of 73%. This is a fairly good response rate. Of the 5171, 121 were people who, even though they had bought an elk tag, did not hunt elk this year. Another 50 surveys were so incomplete they were unusable.

Contingent Valuation Questions Asked

A variety of questions were asked, including hunting preferences, hunting experience, trip expenditures, harvest information, and hunter demographics. A copy of the complete survey is provided in the Appendix. The Contingent Valuation questions were asked for three different scenarios. First the elk hunter was asked to value their most recent elk hunting trip. This dichotomous choice CVM question was: "...would you still have made the trip if you share of the expenses had been $X more?" The hunter would then circle either Yes or No. The dollar amount ($X) was varied across respondents, but the maximum amount any elk hunter was asked to pay was $1100 more.

This question was followed by an open-ended willingness to pay question of the form: "What is the maximum increase in your actual trip cost you would have paid to hunt this specific area instead of hunting elsewhere?" The respondent was then required to fill in a dollar amount reflecting their maximum increase they would pay. Note the question is very specific in that it does not measure the value of elk hunting in general, but rather the value of elk hunting at a particular site.

The next CVM question was asked regarding value of having double the chance to harvest a 6-point or better bull elk. The dichotomous choice question was asked first and this was followed by the open-ended willingness to pay question. Specifically, the dichotomous choice question asked: "Imagine that everything about this last trip were the same, except that your chance of getting a 6-point or better bull elk was twice as great and that your trip costs were $X more than your actual costs. Would you still have made the trip under these circumstances? (Please check one)." The elk hunter was required to check Yes or No. Once again, different hunters received different dollar amounts ($X).

The open-ended willingness to pay question that followed is: "What is the maximum increase in actual trip costs you would pay to double your chances of getting a six-point or better bull elk?" The elk hunter was required to write in the dollar amount of his maximum increase in trip costs he would pay for double chances of bagging a six-point or better bull elk.

The last scenario described to the elk hunter related to reduction in crowding or congestion. The goal was to obtain an estimate of net willingness to pay to reduce the number of other hunters they saw. As before, the dichotomous choice CVM question was asked first followed by the open-ended willingness to pay question. The exact wording was: "Imagine that everything about this last trip were the same, except that you saw half as many hunters as you actually did and your trip costs were $X more than they actually were. Would you have made the trip under these circumstances? (Please check one)."

The open-ended CVM question was: "What is the maximum increase in actual trip costs you would pay to reduce by half the number of hunters you saw while hunting in this area?"

Logit Equations to be Estimated for the CVM Questions

The candidate independent variables that are required by economic theory include trips (measure of quantity), income, and the amount the respondent was asked to pay ($X). In addition, certain other variables would be expected to influence the probability of saying yes they would pay. These might vary by scenario, however. For example, in analyzing willingness to pay for current trip, variables reflecting the quality of current trip such as number of elk seen, number of other hunters seen, etc., would be expected to influence the probability an elk hunter would say "yes" to a given dollar amount.

Equation (1) provides an initial specification of the logit equation which relates the log of the odds of answering "yes would pay" to our candidate independent variables:

$$(1)\quad \ln [P(Y) / 1 - P(Y)] = B0 - B1(BID) + B2(INC) - B3(TRIPS) + B4(ELKSEEN) - B5(HTRSEEN) + B6(HTYRS)$$

Where:

P(Y) = probability of stating "Yes would Pay".
BID = dollar amount of increased trip cost the hunter was asked to pay.
INC = hunter's household income.
TRIPS = number of elk hunting trips to this area.
ELKSEEN = number of elk seen while hunting in this area.
HTRSEEN = number of hunters not in your party that were seen while hunting in this area.
HTYRS = number of years hunting elk in this area.

With some exceptions, these same set of factors would be expected to affect willingness to pay for double chances of bagging a six-point or larger bull elk. However, willingness to pay to increase chances of bagging a bull elk might not be affected by variables such as number of other hunters seen.

In the question on willingness to pay to reduce crowding, the number of other hunters seen would be expected to be significant but now with the opposite sign as in the current condition equation (1). That is, number of hunters seen would lower elk hunting benefits and therefore lower willingness to pay. In the case of willingness to pay to reduce congestion, one would expect the elk hunter to be willing to pay more to reduce congestion, the more other hunters he saw. Therefore, the sign on number of hunters seen should be positive in this equation.

Estimation of the Logit Equations

Equation 1 is inherently non-linear and cannot be accurately approximated by using linear regression. Therefore, it is estimated using logistic regression. Since the dependent variable is the log of the odds ratio, the coefficients cannot be directly interpreted as the change in the probability of paying a given dollar amount.

Sellar, Chavas and Stoll (1986) have demonstrated the relationship between equation 1 and a standard demand function. That is, a demand equation relates quantity demanded to price and other variables such as income, etc.. From equation 1 it is possible to derive an inverse demand function that relates price or value to quantity demand, income, etc.. Since there is a relationship between the logit equation and a demand function, the theoretical properties required of valid demand functions can be used to specify the logit equation. In particular, Sellar, Chavas and Stoll indicate that for the resulting demand

function to be downward sloping with respect to quantity consumed (i.e. trips), the logit equation must be of log-linear functional form and the coefficient on trips (B3) be less than one. This would mean that what should be estimated is of the form:

$$(2)\quad \ln [\, P(Y) \,/\, 1 - P(Y) \,] = B0 - B1 (\ln BID) + B2 (\ln INC) - B3 (\ln TRIPS) + B4 (\ln ELKSEEN) - B5 (\ln HTRSEEN) + B6 (\ln HTYRS)$$

Where:

"ln" = the natural log of the variables previously defined above
$-1 < B3 < 0$

This functional form was used and trips included as the quantity variable unless it had very little explanatory power. It should be noted that in all but one of the estimated logit equations containing trips, the coefficient restriction is met.

As is standard in analysis of CVM responses, some respondents are dropped from the analysis because their responses reflect "protests" to some feature of the simulated market rather than valid expressions of the benefits they receive from hunting at the particular site. As suggested by the U.S. Water Resources Council, a follow up question was asked after each category of the willingness to pay question. As shown in the copy of the survey included in the Appendix, this question asked: "If your answer was zero could you briefly explain why?" These open-ended responses were content analyzed to developed categories of reasons.

The open-ended responses could be first grouped into two major categories. The first group represent those elk hunters who indicated a valid zero willingness to pay and that were included in the analysis. The second group were those elk hunters indicating they were protesting the market set up or did not understand the willingness to pay scenario described in the question (for example, how could you double the chances bagging a 6-point bull elk?). Those that indicated they felt they already paid for improved elk hunting through their taxes or current license fee or were philosophically opposed to fee hunting were excluded from the analysis. Those elk hunters who indicated the willingness to pay scenarios did not make sense or they did not understand the question being asked also were excluded from the analysis.

The elk hunters that indicated any of the following responses were counted as valid zero willingness to pay amounts and were left in for both the dichotomous choice and open-ended willingness to pay analyses. The included categories are:

1. They could not afford a higher trip cost.
2. Indicated they would hunt somewhere else if costs increased.
3. Elk hunting is not good this year.

In essence, response category #1 indicates lack of ability to pay, a legitimate limiting factor. In fact, it is encouraging that hunters recognized their budget constraint or limited income when answering these willingness to pay questions. This response means they took the willingness to pay questions seriously and answered them as if they actually would have to pay.

The second two factors just indicate that given the availability of substitutes (reason #2) or the hunting quality this year (reason #3) there really are no net benefits or consumer surplus to these hunters from this particular elk hunting site.

CHAPTER IV

STATISTICAL RESULTS: STATE AVERAGE, HUNT AREAS AND ADMINISTRATIVE REGIONS

This Montana Elk hunting data set can be analyzed in a number of ways. Since the number of observations for each Hunting Area was two to ten times as large as in the baseline elk hunting report, Hunt Area specific values are provided to value current hunting conditions in Hunt Areas analyzed. Since not all Hunt Areas in the State were analyzed, Figure 2 provides a map as to what Hunt Areas are reflected in this report. These values may be of use to planners and economists in performing site specific analyses.

The primary contribution from analysis of this data set as compared to the baseline elk hunting lies in two areas:

(1) Change in elk hunter benefits associated with harvesting six point or better bull elk and benefits of reduced congestion in Hunt Areas, and

(2) Estimation of benefits of elk hunting stratified by the type of hunter and his motivation for elk hunting.

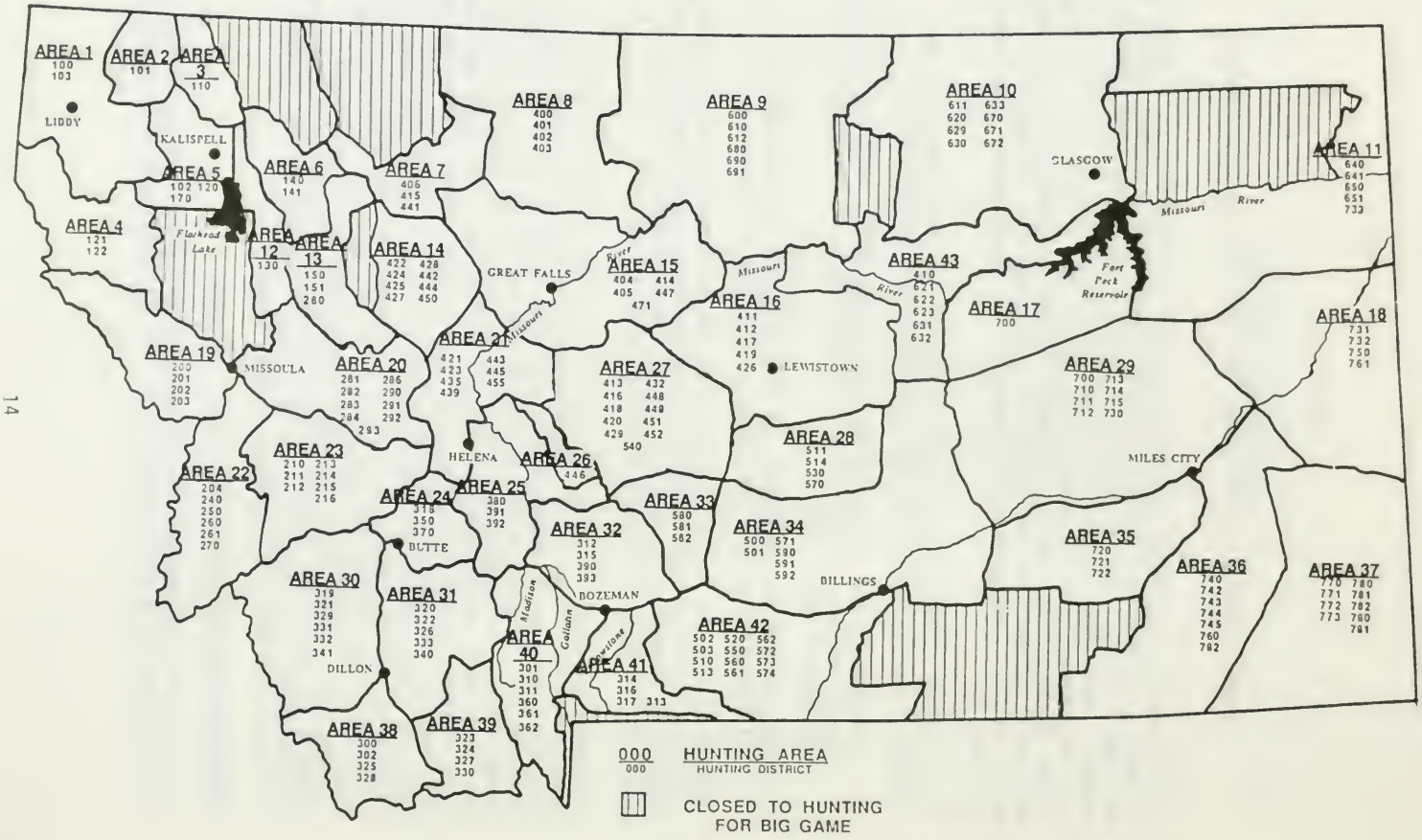
This stratification is referred to as hunters classifed into "preference clusters" based on the hunters responses to a set of questions designed to measure their motivations for hunting and preferences regarding the hunting experience.

Elk hunting benefits are estimated by Hunt Area, Montana Department of Fish, Wildlife and Parks Administrative Region, and for the State as a whole under current conditions, for doubling chances for bagging a six point or better bull elk, and reducing congestion. In addition, elk hunting benefits by elk hunter type are presented at the State level in Chapter VI. The outline of this section is as follows: first the logit equations reflecting willingness to pay for current conditions, double chances to harvest a six-point or better bull elk and reducing crowding are presented at the State level in Tables 1-3. The logit equations for these three scenarios are then reported for each Hunt Area in Tables 4-6. Finally, the logit equations for the Montana Department of Fish, Wildlife and Parks Administrative Regions are presented in Tables 7-9. Chapter V presents the benefit estimates by State, Region and Hunt Areas.

Estimated Logit Equations: State Average

The following equation was estimated for probability of paying an increase in hunting costs for the current hunting condition.

Figure 2. **ELK HUNTING AREAS**



* Please put AREA #, not hunting District # on the survey form.

Table 1. Montana elk hunting logit equation, current conditions.

	Const.	LCRBID	LTRIPS	LINCOME	LELKSEEN
	-2.0504	-0.6936	-0.1902	0.4946	0.12835
(T stat's)	(-2.58)	(-13.22)	(-4.60)	(6.407)	(6.98)

All of the coeficients are statistically significant at the 99% or better. The variables have the expected signs.

The next equation reflects probability of paying a higher trip cost for doubling chances of harvesting a six point or larger bull elk.

Table 2. Montana elk hunting logit equation, six-point or larger bull elk.

	Const.	LBULBID	LTRIPS	LINCOME	LELKSEEN	LHTRSEEN
	0.4126	-0.8362	-0.1468	0.3696	0.0651	0.0486
(T stat's)	(0.53)	(-14.44)	(-3.52)	(4.877)	(3.65)	(1.938)

The slope coefficients are significant at the 95% level and all have the expected sign, except for LHTRSEEN.

The next equation represents probability of paying a higher trip cost for reducing the number of other elk hunters seen by half.

Table 3. Montana elk hunting logit equation reduce number of other hunters seen in half.

	Const.	LCWDBID	LTRIPS	LINCOME	LELKSEEN	LHTRSEEN
	-0.21	-0.898	-0.1315	0.4142	0.1107	0.0427
(T stat's)	(-0.266)	(-15.21)	(-5.35)	(5.35)	(5.96)	(1.655)

Once again, the coefficients are significant at the 90% level or higher and have the expected sign.

The positive sign on hunters seen is expected, since the probability of paying an increase in trip cost to see fewer hunters would be expected to rise the more hunters one saw. That is, if you saw a large number of hunters you would pay more to reduce crowding then if you saw very few hunters.

Estimated Logit Equations: Hunt Area and Administrative Regions

The results of the Montana Elk logit regressions without preference clusters are presented in Tables 4 through 6 for the Hunt Area analysis and in Tables 7 through 9 for the Regional analysis. (See map to determine geographical coverage of Hunt Areas). The logistic regressions have been calculated using the semi-log form, with the regressors in natural log form and the dependent variable in the original dollar form. The regressors include the log of Trips, Income, Elk Seen, Hunters Seen and Years Hunted, which appear in abbreviated form in the tables. The bid regressors for current conditions, bigger bulls, and the crowding categories are respectively, LCRBID, LBULBID, and LCWDBID.

Table 4. Hunt area specific logit equations for current condition (t-statistics in parentheses).

SITE	Const.	LCRBID	LTRIPS	LINCOME	LELKSEEN	LHTRSEEN	LHTYRS
1	-3.5516	-0.7723	-0.1085	0.6645	0.1269		
	(-1.56)	(-5.39)	(-0.81)	(3.01)	(1.67)		
13	3.03	-0.7136					0.4198
	(2.69)	(-3.19)					(1.51)
14	2.6904	-0.5729	-0.2622		0.1891	-0.0981	
	(3.91)	(-4.49)	(-1.77)		(3.06)	(-0.99)	
19	2.0132	-0.8018	-0.1788	0.1347			
	(0.96)	(-5.13)	(-1.29)	(0.69)			
20	-3.1547	-0.8361	-0.3723	0.6744	0.2366	-0.1141	
	(-1.51)	(-6.02)	(-2.69)	(3.31)	(3.56)	(-1.3)	
24	-6.0099	-0.4886	-0.2661	0.7577	0.1852		
	(-1.61)	(-2.15)	(-1.14)	(2.16)	(1.64)		
25	1.9564	-0.5658	-0.2841		0.2189		
	(2.61)	(-3.68)	(-1.87)		(2.79)		
26	-0.2249	-0.7746	-0.2095	0.3867	0.2027		
	(-0.06)	(-2.76)	(-0.66)	(1.04)	(1.63)		
30	-0.0325	-0.6265	-0.3535	0.2649	0.2346		
	(-0.016)	(-4.81)	(-2.65)	(1.4)	(3.44)		
31	-2.6274	-0.6219	-0.3473	0.5176	0.2546		
	(-1.064)	(-3.7)	(-1.99)	(2.14)	(3.14)		
32	-3.4608	-0.9223	-0.4441	0.6943	0.2299		
	(-1.023)	(-3.66)	(-1.46)	(2.07)	(1.99)		
38	-0.1028	-0.2132	-0.6542		0.434		
	(-0.08)	(-0.93)	(-2.0)		(2.49)		
39	-2.4074	-0.881	-0.3282	0.6613			
	(-0.74)	(-4.46)	(-1.53)	(2.05)			
40	1.8159	-0.4418	-0.3218		0.1696		
	(3.19)	(-3.87)	(-2.27)		(2.94)		
41	-3.2554	-0.5315	-0.0924	0.5602	0.1223		
	(-1.72)	(-3.8)	(-0.59)	(3.07)	(1.97)		
42	-3.9344	-0.5263	-0.2471	0.6136	0.1009		
	(-1.39)	(-2.45)	(-1.24)	(2.16)	(1.05)		
43	6.2272	-1.05934	-0.9745				
	(2.37)	(-2.18)	(-1.61)				

Table 5. Hunt Area Specific logit equations for double chances of harvesting a six-point or larger bull elk (t-statistics in parentheses).

SITE	CONST.	LBULBID	LTRIPS	LINCOME	LELKSEEN	LHTRSEEN
1	-2.0447	-0.6026	-0.0234	0.4856		
	(-0.97)	(-4.46)	(-0.18)	(2.39)		
13	-2.7239	-0.8641		0.7371		
	(-0.93)	(-3.72)		(2.39)		
14	3.4694	-0.6542			0.0855	-0.0571
	(4.95)	(-4.91)			(1.47)	(-0.59)
19	1.6802	-0.6599	-0.06539	0.1756		
	(0.94)	(-4.46)	(-0.5)	(0.98)		
20	2.5705	-0.9766	-0.3726	0.2094	0.2034	-0.0433
	(1.32)	(-6.69)	(-2.73)	(1.12)	(3.22)	(-0.51)
24	1.9049	-0.4873				
	(2.32)	(-2.85)				
25	3.3664	-0.711	-0.1823	0.0954		
	(4.49)	(-4.72)	(-1.28)	(1.38)		
26	5.3598	-1.0659				
	(3.33)	(-3.32)				
30	0.7252	-0.8658	-0.2505	0.3606	0.1107	
	(0.36)	(-6.38)	(-1.9)	(1.83)	(1.61)	
31	1.7055	-0.9356	-0.2108	0.3379		
	(0.67)	(-4.83)	(-1.27)	(1.42)		
32	-1.1056	-0.6469	-0.5852	0.4961		
	(-0.38)	(-2.82)	(-2.09)	(1.76)		
38	-7.3716	-1.7672	-0.665	1.666		
	(-1.3)	(-3.73)	(-1.25)	(2.66)		
39	-4.1954	-0.8428	-0.6535	0.8739		
	(-1.26)	(-4.19)	(-2.6)	(2.64)		
40	-0.7567	-0.7505	-0.1522	0.4963		
	(-0.4012)	(-5.273)	(-1)	(2.7)		
41	-2.9033	-0.8586	-0.3879	0.7733		
	(-1.59)	(-5.57)	(-2.34)	(4.23)		
42	-3.1015	-0.7957	-0.4385	0.7819		
	(-1.09)	(-2.98)	(-2.02)	(2.66)		
43	-2.9625	-2.3524	-1.2394	1.4912		
	(-0.36)	(-2.16)	(-1.8)	(1.49)		

Table 6. Hunt area specific logit equations for reducing number of other elk hunters seen by half (t-statistics in parentheses).

Site	Const.	LCWDBID	LTRIPS	LINCOME	LELKSEEN	LHTRSEEN	LHTYRS
1	-0.5901	-0.7639	-0.1689	0.3935	0.1229		
	(-0.28)	(-4.49)	(-1.24)	(1.99)	(1.73)		
13	6.1876	-1.2432	-0.2775		0.1086	-0.111	
	(4.73)	(-4.76)	(-0.98)		(1.02)	(-0.88)	
14	2.779	-0.8841		0.1364	0.1557	0.0197	
	(1.36)	(-5.80)		(0.70)	(2.50)	(0.20)	
17	4.6851	-0.9407					
	(1.15)	(-1.13)					
19	-3.2318	-0.923		0.698			0.1716
	(-1.56)	(-5.89)		(3.28)			(1.79)
20	0.1714	-1.1578	-0.2487	0.5614	0.121	-0.1291	-0.3163
	(0.08)	(-6.62)	(-1.52)	(2.57)	(1.57)	(-1.29)	(-1.75)
24	-2.6266	-1.9535	-0.6557	1.0786			0.7552
	(-0.6)	(-3.95)	(-1.68)	(2.47)			(1.85)
25	5.5769	-1.222	-0.3356				
	(5.45)	(-5.82)	(-2.12)				
26	2.8653	-0.5823					
	(2.5)	(-2.42)					
30	-5.5727	-0.8365	-0.1416	0.9079		0.08874	
	(-2.45)	(-5.9)	(-1.08)	(3.92)		(0.93)	
31	3.6933	-0.7603	-0.4027			0.1674	
	(4)	(-4.43)	(-2.37)			(1.47)	
32	3.3894	-0.6597	-0.7919			0.1553	
	(3.45)	(-3.37)	(-2.68)			(1.16)	
38	5.3301	-1.1111					
	(3.51)	(-3.42)					
39	-6.0544	-0.9492	-0.1908	1.0395			
	(-1.81)	(-4.68)	(-0.9)	(3.09)			
40	-0.5221	-0.7232	-0.2377	0.4191			
	(-0.28)	(-5.3)	(-1.6)	(2.32)			
41	-1.3177	-0.84944	-0.2415	0.5738			
	(-0.76)	(-6.02)	(-1.55)	(3.24)			
42	-5.153	-0.9527	-0.4474	0.9451		0.2276	
	(-1.69)	(-3.15)	(-2.04)	(3.07)		(1.39)	
43	-11.699	-0.9325		1.5509			
	(-1.74)	(-1.56)		(2.01)			

Table 7 presents the logit equations estimated for Montana Department of Fish, Wildlife and Parks administrative Regions. These equations reflect the probability of paying a higher trip cost for current hunting conditions.

Table 7. Regional logit equations for Montana elk current conditions (t-statistics in parentheses).

Region	Const.	LCRBID	LTRIPS	LINCOME	LELKSEEN	LELKKILL
1	0.1092	-0.6697	-0.1416	0.2776	0.055	
	(0.06)	(-6.23)	(-1.28)	(1.59)	(0.95)	
2	-0.6647	-0.8058	-0.2638	0.4005	0.137	
	(-0.46)	(-7.96)	(-2.75)	(2.87)	(2.94)	
3	-1.3566	-0.5743	-0.2885	0.3905	0.1546	0.1331
	(-1.67)	(-10.76)	(-5.02)	(5.12)	(5.7)	(2.12)
4	0.6879	-0.6027	-0.297	0.2424	0.1482	0.2349
	(0.38)	(-5.3)	(-2.18)	(1.39)	(2.46)	(1.54)

Table 8 presents the logit equations estimated for Montana Department of Fish, Wildlife and Parks administrative regions. These equations reflect the probability of paying a higher trip cost for double chances of harvesting a six-point or larger bull elk.

Table 8. Regional logit equations for double chances to harvest six-point or larger bull elk (t-statistics in parentheses).

Region	Const.	LBULBID	LTRIPS	LINCOME	LELKSEEN
1	-1.9769	-0.6678	-0.1193	0.5354	0.0576
	(-1.11)	(-5.68)	(-1.07)	(3.06)	(1.04)
2	2.0556	-0.8226	-0.2076	0.1992	0.0935
	(1.58)	(-8.08)	(-2.21)	(1.56)	(2.12)
3	-0.4077	-0.823	-0.354	0.4791	0.0667
	(-0.51)	(-13.9)	(-5.95)	(6.24)	(2.59)
4	1.4406	-0.7722	-0.1218	0.2448	0.0668
	(0.8)	(-6.01)	(-0.92)	(1.4)	(1.28)

Table 9 presents the logit equations estimated for Montana Department of Fish, Wildlife and Parks administrative regions. These equations reflect the probability of paying a higher trip cost for reducing by half the number of hunters seen.

Table 9. Regional logit equations for seeing half as many elk hunters (t-statistics in parentheses).

Region	Const.	LCWDBID	LTRIPS	LINCOME	LELKSEEN	LHTRSEEN
1	2.2059	-0.9061	-0.2385	0.1995	0.1299	
	(1.19)	(-6.41)	(-2.05)	(1.15)	(2.24)	
2	-0.8556	-0.8797	-0.0505	0.4515	0.0971	
	(-0.62)	(-8.9)	(-0.52)	(3.34)	(2.11)	
3	-0.7911	-0.8763	-0.3176	0.4656	0.1167	0.1199
	(-0.97)	(-14.27)	(-5.27)	(5.82)	(4.36)	(3.13)
4	1.5665	-0.8155		0.2039	0.1357	0.0876
	(0.87)	(-6.3)		(1.18)	(2.61)	(1.07)

In general, the hunt area logit equations presented in the tables above are statistically significant. All the variables have the expected sign. The coefficient on bid amount is consistently negative and statistically significant in 65 out of 67 regressions. The coefficient on trips has the desired sign and meets the size ($-1 < B3 < 0$) required by theory in all but one case. The income coefficient is quite significant in the logit equations indicating that willingness to pay is sensitive to income.

CHAPTER V

BENEFIT ESTIMATES

Two estimates of mean willingness to pay are provided. One, listed as MEAN-LOGIT in the tables presented below, is based on truncating the area under the logit equation at the largest increase in trip costs that elk hunters in the sample were asked to pay. This amount was $1,100. The logic behind this truncation level related to a desire not to extrapolate the logit curve beyond the range of the observed data. The second mean value, MEAN-OE.CVM, is simply the mean of the hunters' open-ended willingness to pay response for each of the conditions. Median values are also presented for the readers information, although median benefits are rarely appropriate when performing Benefit Cost Analysis.

The mean and median values of willingness to pay for the current condition were used as the base value for current hunting conditions. As will be recalled from the previous section describing the willingness to pay questions, the hunter was asked whether they would pay a given increase in trip costs (and then asked their maximum willingness to pay) for doubling chances of harvesting a six point or better bull elk, holding everything else about their current trip constant. Therefore, the difference between the values of each of the two hypothetical conditions (bigger elk and reducing number of other hunters seen by one-half) and those for the current conditions is the increase in willingness to pay or benefits associated with changing just that characteristic of the hunting trip. These differences are presented alongside the mean and median values in Tables 10, 11 and 12 for the State level, Hunt Areas and Administrative Regions, respectively. These differences provide information about how the value of elk hunting changes when just one of these qualitative dimensions of an elk hunting trip change.

State Average Elk Hunting Benefits

Table 10 displays the mean willingness to pay for the average of all Hunt Areas in the survey (which does not perfectly represent the elk hunting areas in the State, however) as calculated from the logit equation and the open-ended willingness to pay question. These trip values are then converted to a value per hunter day and a value per 12-hour Recreation Visitor Day (RVD).

Table 10. State average net economic values per trip and per hunter day (all sites combined).

VALUES PER TRIP:

Cur Cond	6-point	Elk	Diff	1/2 Crowds	Diff
MEAN LOGIT	$262.31	$345.44	$83.13	$258.69	($3.62)
MEAN-OE.CVM	$93.61	$119.89	$26.28	$99.13	$5.52
(Std. Error)	(6.83)	(7.62)		(7.08)	
MEDIAN-LOGIT	$72.27	$135.22	$62.95	$84.95	$12.68

VALUES PER HUNTER DAY AND 12 HR RVD:

	HUNTER DAY	RVD
	Current Condition	Current Condition
MEAN LOGIT:	$ 39.90	$ 62.18
MEAN-OE.CVM	$ 14.24	$ 22.19
MEDIAN-LOGIT:	$ 10.99	$ 17.13

KEY:

MEAN-LOGIT: Mean from the logit model, with the truncation is set at the maximum bid of $1,100.

MEAN-OE.CVM: Mean of the hunter's response to the open-ended willingness to pay question.

MEDIAN-LGT: The median of the logit equation
= EXP (-CONSTANT / VAR. COEFF.)

Table 10 indicates several things. First, elk hunting trips are relatively valuable whether mean of the logit equation or mean of the open-ended CVM is used. It is worth noting the estimate of benefits from this open-ended CVM survey is similiar in magnitude to what Duffield calculated for Montana elk hunters in his baseline economic study (Duffield, 1988). Secondly, all hunters are willing to pay more for doubling chances to harvest a 6pt or larger bull elk. Using the statistical average willingness to pay, elk hunters in Montana are not willing to pay any additional for reducing in half the number of elk hunters they see. However, the median shows there is some benefit to reducing crowding. What appears to be occuring is that for a majority of elk hunters, seeing half as many matters, but only somewhat. To a minority of hunters it does not matter at all, and this is pulling the mean willingess to pay down, but has little effect on the median.

At this point, it may be worthwhile to discuss in more detail just how maximum willingness to pay is calculated from the logit equation. These mean values are calculated using the area under the logit regression function. The area under a logit regression function is estimated by integration of the function. The vertical axis of this two dimensional area is the probability that a particular increase in trip cost would be paid by the respondent. The horizontal axis represents the increase in trip costs the elk hunter was asked to pay (referred to as the bid amount). One would expect that the higher the dollar amount of trip costs a hunter was asked to pay, the lower is the probability that a hunter would pay a particular increase in trip costs. As everyone included in the regression is willing to pay at least zero dollars, the probability of this value is equal to one. This means that 100% of all hunters would pay at least this amount. For any bid value in excess of the maximum bid amount, the probability of that value is assumed zero. Hence, for the estimation of the areas, the integrations are truncated at the maximum bid amount, which is $1,100.00 for the standardized approach. Figure 3 provides an estimated logit equation for site 30. The area under this curve which is the sum of height (probability would pay) times the width (dollar amount) yields the expected value of willingness to pay, i.e. the mean or average willingness to pay.

Because the areas are calculated for a two-dimensional space, while the logit equations represent multiple variable relationships that are larger than two-dimensions, the logit equations must be collapsed in such a manner that the equations can be represented in two-dimensional space. The constants for the collapsed equations, as presented in Tables 11 and 12, are the sum of the products of the coefficients of the regressors and their respective means, excluding the bid amount regressor, which is the slope of the equation. The constant and the slope, or log of the bid amount, which is listed under VAR COEFF in

FIGURE 3

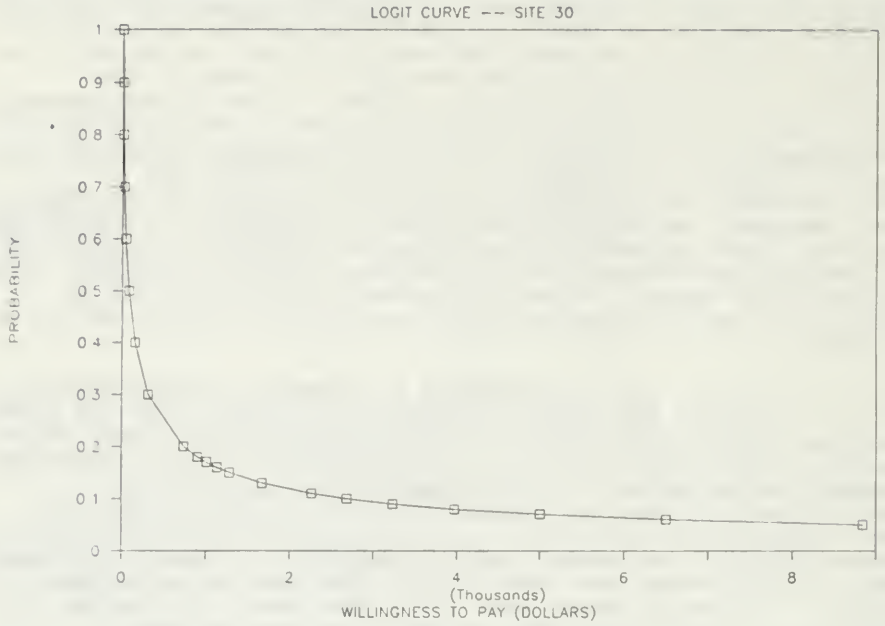


Figure 3. Estimated Logit Equation for Hunting Area.

Table 11. Montana elk hunting values by hunt area, current condition.

CURRENT CONDITION

Hunt Areas:	1	13	14
CONSTANT:	3.091	3.6228	2.3888
VAR COEFF:	-0.7723	-0.7136	-0.573
MEAN LOGIT:	$211.48	$385.58	$295.56
MEAN-OE.CVM	$88.13	$130.34	$95.25
MEDIAN-LOGIT	$54.73	$160.26	$64.65

DOUBLE CHANCES OF 6PT OR LARGER BULL ELK

Sites:	1	Difference	13	Difference	14	Difference
CONSTANT:	2.8655		4.9144		3.3611	
VAR COEFF:	-0.6026		-0.864		-0.6542	
MEAN LOGIT:	$356.50	$145.02	$475.97	$90.39	$406.36	$110.80
MEAN-OE.CVM:	$118.08	$29.95	$190.93	$60.59	$150.62	$55.37
MEDIAN-LOGIT:	$116.19	$61.46	$295.29	$135.03	$170.33	$105.68

REDUCE NUMBER OF ELK HUNTERS SEEN BY HALF

Sites:	1	Difference	13	Difference	14	Difference
CONSTANT	3.2179		6.0205		4.2617	
VAR COEFF:	-0.7639		-1.2432		-0.8841	
MEAN LOGIT:	$246.08	$34.60	$249.64	($135.94)	$308.84	$13.28
MEAN-OE.CVM:	$39.02	($49.11)	$109.02	($21.32)	$102.00	$6.75
MEDIAN-LOGIT	$67.52	$12.80	$126.82	($33.44)	$124.01	$59.37

CURRENT CONDITION

Sites:	17	19	20
CONSTANT:	NOT AVAIL.	3.1519	3.3243
VAR COEFF:		-0.8018	-0.8361
MEAN-LOGIT		$198.37	$199.95
MEAN-OE.CVM:	$100.00	$53.67	$85.25
MEDIAN-LOGIT		$50.96	$53.30

Table 11. (continued)

DOUBLE CHANCES OF SIX-POINT OR LARGER BULL ELK

Sites:	17	Difference	19	Difference	20	Difference
CONSTANT:	NOT AVAIL.		3.3647		4.4399	
VAR COEFF:			-0.6599		-0.9766	
MEAN LOGIT:			$399.55	$201.18	$247.77	$47.82
MEAN-OE.CVM:	$142.86	$42.86	$100.96	$47.29	$121.19	$35.94
MEDIAN-LOGIT			$163.83	$112.87	$94.28	$40.98

REDUCE NUMBER OF ELK HUNTERS SEEN BY HALF

Sites:	17	Difference	19	Difference	20	Difference
CONSTANT:	4.6851		4.0414		4.8849	
VAR COEEF:	0.9407		-0.923		-1.1578	
MEAN LOGIT:	$322.32		$231.70	$33.33	$168.17	($31.78)
MEAN-OE.CVM:	$72.50	($27.50)	$51.10	($2.57)	$53.28	($31.97)
MEDIAN-LOGIT	$145.54		$79.72	$28.76	$67.97	$14.67

CURRENT CONDITION

Hunt Areas:	24	25	26
CONSTANT:	1.42289	2.060299	4.002228
VAR COEFF:	-0.4886	-0.56581	-0.77462
MEAN LOGIT:	$208.80	$242.22	$392.90
MEAN-OE.CVM:	$56.40	$78.19	$177.23
MEDIAN-LGT	$18.39	$38.14	$175.34

DOUBLE CHANCES OF 6PT OR LARGER BULL ELK

Sites:	24	Difference	25	Difference	26	Difference
CONSTANT:	1.9049		3.349107		5.3598	
VAR COEFF:	-0.4872		-0.711		-1.06585	
MEAN LOGIT:	$304.15	$95.35	$333.62	$91.40	$309.47	($83.43)
MEAN-OE.CVM:	$84.77	$28.37	$100.67	$22.48	$168.80	($8.43)
MEDIAN-LGT	$49.87	$31.48	$111.10	$72.96	$152.73	($22.61)

Table 11. (continued)

REDUCE NUMBER OF ELK HUNTERS SEEN BY HALF

Sites:	24	Difference	25	Difference	26	Difference
CONSTANT:	8.36813		5.231467		2.8653	
VAR COEFF:	-1.9535		-1.22197		-0.58227	
MEAN LOGIT:	$110.95	($97.85)	$166.78	($75.44)	$386.29	($6.61)
MEAN-OE.CVM:	$64.90	$8.50	$43.66	($34.53)	$62.40	($114.83)
MEDIAN-LGT:	$72.50	$54.10	$72.33	$34.18	$137.12	($38.21)

CURRENT CONDITIONS

Sites:	30	31	32
CONSTANT:	2.74907	2.765700	3.620558
VAR COEFF:	-0.6265	-0.62189	-0.92231
MEAN LOGIT:	$311.28	$313.32	$173.24
MEAN-OE.CVM:	$92.25	$97.20	$162.65
MEDIAN-LOGIT	$80.47	$85.39	$50.68

DOUBLE CHANCES OF SIX-POINT OR LARGER BULL ELK

Sites:	30	Difference	31	Difference	32	Difference
CONSTANT:	4.35937		4.948152		3.425224	
VAR COEFF:	-0.8657		-0.93557		-0.64691	
MEAN LOGIT:	$344.45	$33.17	$378.10	$64.78	$426.02	$252.78
MEAN-OE.CVM:	$130.17	$37.92	$184.18	$86.98	$146.90	($15.75)
MEDIAN-LOGIT	$153.72	$73.25	$198.13	$112.74	$199.29	$148.61

REDUCE NUMBER OF ELK HUNTERS SEEN BY HALF

Sites:	30	Difference	31	Difference	32	Difference
CONSTANT:	3.76240		3.662826		2.987503	
COEFF:	-0.8364		-0.76032		-0.65973	
MEAN LOGIT:	$264.83	($46.45)	$330.20	$16.88	$321.42	$148.18
MEAN-OE.CVM:	$64.50	($27.75)	$91.19	($6.01)	$58.74	($103.91)
MEDIAN-LOGIT	$89.83	$9.36	$123.65	$38.26	$92.61	$41.93

Table 11. (continued)

CURRENT CONDITION

Hunt Area:	38	39	40
CONSTANT:	0.64211	4.220139	1.964665
VAR COEFF:	-0.2131	-0.88103	-0.44175
MEAN LOGIT:	$377.58	$300.47	$371.04
MEAN-OE.CVM:	$126.61	$83.30	$138.41
MEDIAN-LOGIT	$20.34	$120.30	$85.41

DOUBLE CHANCES OF SIX-POINT OR LARGER BULL ELK

Sites:	38	Difference	39	Difference	40	Difference
CONSTANT:	9.31981		4.446134		4.269649	
VAR COEFF:	-1.7672		-0.84281		-0.7505	
MEAN LOGIT:	$287.90	($89.68)	$391.65	$91.18	$478.80	$107.76
MEAN-OE.CVM:	$143.76	$17.15	$173.43	$90.13	$221.70	$83.29
MEDIAN-LOGIT	$195.15	$174.81	$195.46	$75.16	$295.62	$210.21

REDUCE NUMBER OF ELK HUNTERS SEEN BY HALF

Sites:	38	Difference	39	Difference	40	Difference
CONSTANT	5.3302		4.524324		3.674611	
VAR COEFF:	-1.1111		-0.94921		-0.7232	
MEAN LOGIT:	$261.06	($116.52)	$279.97	($20.50)	$377.85	$6.81
MEAN-OE.CVM:	$53.25	($73.36)	$82.43	($0.87)	$95.31	($43.10)
MEDIAN-LOGIT	$121.17	$100.84	$117.50	($2.80)	$160.94	$75.53

CURRENT CONDITION

Sites:	41	42	43
CONSTANT:	2.51313	2.309059	6.081154
VAR COEFF:	-0.5315	-0.52631	-1.05934
MEAN LOGIT:	$375.98	$344.10	$469.58
MEAN-OE.CVM:	$181.16	$109.63	$178.81
MEDIAN-LOGIT:	$113.08	$80.42	$311.22

Table 11. (continued)

DOUBLE CHANCES OF SIX-POINT OR LARGER BULL ELK

Sites:	41	Difference	42	Difference	43	Difference
CONSTANT:	4.90805		4.629274		12.54760	
VAR COEFF:	-0.8586		-0.79568		-2.3524	
MEAN LOGIT:	$483.72	$107.74	$512.57	$168.47	$268.66	($200.92)
MEAN-OE.CVM:	$242.90	$61.74	$228.27	$118.64	$176.82	($1.99)
MEDIAN-LOGIT	$303.79	$190.71	$336.30	$255.88	$207.26	($103.97)

REDUCE NUMBER OF ELK HUNTERS SEEN BY HALF

Sites:	41	Difference	42	Difference	43	Difference
CONSTANT:	4.49167		4.642441		4.538431	
VAR COEFF:	-0.8494		-0.95269		-0.93249	
MEAN LOGIT:	$392.74	$16.76	$302.96	($41.14)	$305.07	($164.51)
MEAN-OE.CVM:	$132.85	($48.31)	$87.79	($21.84)	$83.96	($94.85)
MEDIAN-LOGIT:	$197.90	$84.82	$130.71	$50.29	$129.93	($181.29)

KEY: MEAN-LOGIT = The truncation is set at the bid of $1,100.
MEAN-OE.CV. = Mean of the hunter's willingness to pay.
MEDIAN-LOGIT = The median is calculated as EXP(-CONSTANT/VAR COEFF.).

Table 12. Montana elk hunting values by region.

Region 1

	Current Condition	Bigger Elk	Diff.	1/2 Crowds	Diff.
CONSTANT:	2.8211	3.3919		4.0472	
VAR COEFF.:	-0.6697	-0.6678		-0.9061	
MEAN LOGIT:	$271.97	$395.28	$123.31	$247.53	($24.44)
MEAN-OE.CVM:	$100.59	$139.64	$39.05	$72.90	($27.69)
MEDIAN-LOGIT	$67.52	$160.65	$93.12	$87.06	$19.54

Region 2

	Current Condition	Bigger Elk	Diff.	1/2 Crowds	Diff.
CONSTANT:	3.2044	3.9178		3.73	
VAR COEFF:	-0.8058	-0.8226		-0.8797	
MEAN LOGIT:	$205.28	$311.45	$106.17	$221.37	$16.09
MEAN-OE.CVM:	$72.11	$113.00	$40.89	$52.48	($19.63)
MEDIAN-LOGIT	$53.34	$117.06	$63.72	$69.41	$16.07

Region 3

	Current Condition	Bigger Elk	Diff.	1/2 Crowds	Diff.
CONSTANT:	2.4712	4.3409		4.1911	
VAR COEFF:	-0.5743	-0.823		-0.8763	
MEAN LOGIT:	$311.54	$403.29	$91.75	$300.87	($10.67)
MEAN-OE.CVM:	$118.57	$172.47	$53.90	$91.26	($27.31)
MEDIAN-LOGIT	$73.92	$195.29	$121.37	$119.43	$45.51

Region 4

	Current Condition	Bigger Elk	Diff.	1/2 Crowds	Diff.
CONSTANT:	2.6749	3.9126		3.9286	
VAR COEFF:	-0.6027	-0.7722		-0.8155	
MEAN LOGIT:	$320.63	$374.35	$53.72	$320.61	($0.02)
MEAN-OE.CVM:	$111.90	$152.44	$40.54	$94.17	($17.73)
MEDIAN-LOGIT:	$84.62	$158.67	$74.05	$123.64	$39.02

KEY: MEAN LOGIT = The truncation is set at the maximum bid of $1,100.
MEAN-OE.CVM = Mean of the hunter's willingness to pay.
MEDIAN-LGT = The median is calculated as EXP (-CONSTANT / VAR. COEFF.).

FIGURE 4

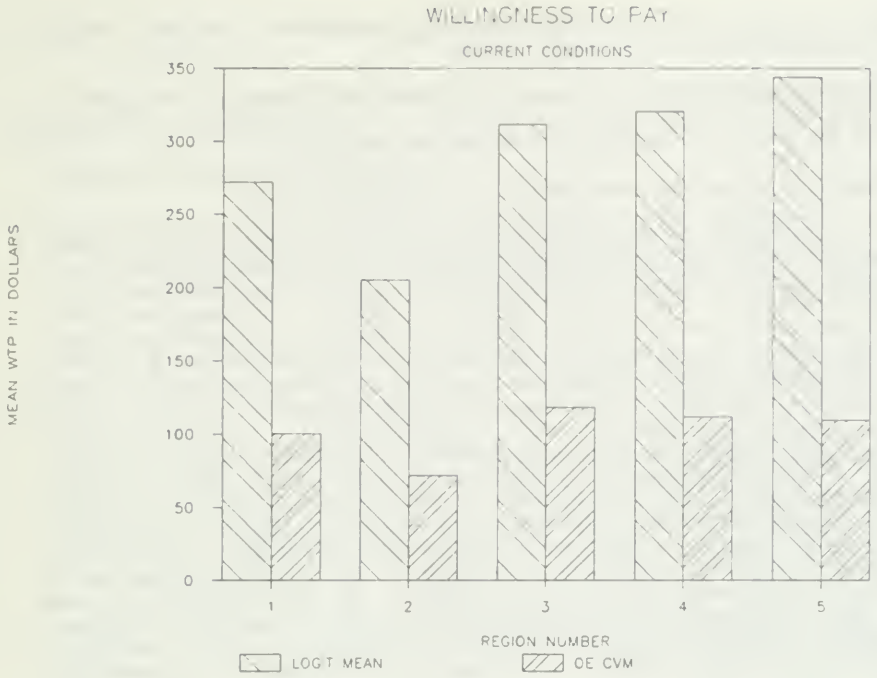


Figure 4. Elk Hunters' Willingness to Pay for Current Hunting Conditions.

Tables 11 and 12, are entered in the integration program, which then calculates the mean bid value.

The median bid amount, presented in Tables 11 and 12 for the analyses without preference clusters is calculated as the antilog of the negative of CONSTANT divided by VAR COEFF.

Hunt Area and Region Average Elk Hunting Benefits

Table 11 presents the estimated means and medians of willingness to pay for Elk hunting in Montana for the by Hunting Area analysis. Table 12 presents the means and medians for the by Region analysis. For the by Region analysis, the data was separated into the five administrative Regions in Montana that have substantial amounts of elk hunting. Since Region 5 and Area 42 share identical boundaries, the results for Region 5 and Area 42 are the same and can be found in Table 11.

Table 12 presents the mean and median willingness to pay from grouping the above sites by Montana Department of Fish, Wildlife and Parks Administrative Regions. Since not all sites in each Region are represented, the Regional values reflect a somewhat restrictive sample. The sample of sites was chosen by Montana Department of Fish, Wildlife and Parks. For example, Regions 1, 2 4 and 5 represent four hunt districts, 14 hunt districts, nine hunt districts and 12 hunt districts, respectively (See the map for exact locations of hunt districts surveyed in this analysis). However, for Region 3 all of the hunt districts are represented.

Figure 4 displays a comparison by Region of willingness to pay amounts for the current conditions of selected Hunt Areas within the Region. Both the logit means and the open-ended means follow the same pattern by Region. The relatively high value for Region 5 may be due to the fact that only that portion of Region 5 near Yellowstone (Hunt Area 42 on the Map) is included. In addition, Hunt Area 42 is relatively close to the major population center in Montana, that being Billings.

CHAPTER VI

ANALYSIS OF MONTANA ELK HUNTERS STRATIFIED BY PREFERENCE TYPE

Hunter Preference Groupings

Several questions included in the survey were designed to identify the primary motivations people had for going elk hunting, the particular settings they preferred to hunt elk in (e.g., roaded, unroaded) and the types of hunting experiences they preferred.

One of the goals of this study and another way it is different from the Montana Baseline Hunter study (Duffield, 1988) is the investigation of how economic values varied across different types of hunters. For example, other researchers (King and Hof, 1985; Richards, 1985; and Duffield and Allen, 1988) determined the value of trout fishing did vary by different angler motivations and/or preferences. The same type of relationship may be present for elk hunting. For example, one could hypothesize there are meat hunters and trophy hunters. It is quite possible that willingness to pay for both the current hunting conditions, and enhanced opportunities to harvest a trophy elk would be different for these two different types of hunters. In one sense, the concept of "market segmentation" is applied to the case of elk hunters to see if there really are different "markets" for different types of hunting experiences.

To classify sampled hunters into the different hunter types a series of 16 questions were asked regarding the importance of 16 elk hunting motivations. Among the possible motivations for elk hunting: the importance of solitude, harvesting a trophy elk, being in the outdoors, for the meat, to view scenery, to hunt with family members or friends and to be in a natural setting. Another interpretation of these factors relates to the type of hunting experience the elk hunter desired to have on his trip. The hunter rated the importance of these motivations on a four point interval scale.

A cluster analysis package (SPSSx) was used to identify subgroups of hunters based on their responses to these motivational questions. That is, the program generates a "hunter profile" associated with a certain combination of responses that are relatively unique compared to another combination of responses. These mutually exclusive combinations of responses each reflect a different motivational cluster or hunter experience. Thus, hunters with similar ratings for important and unimportant items have fairly homogenous preferences and are therefore grouped together. In our study Allen (1988) created four different

clusters that represented four distinct hunter clusters or preference sets.

These four hunter types are: (1) Multiple Experience hunters, who are serious hunters with dual harvest objectives-meat and trophy but who also stress enjoyment of solitude; (2) Meat Hunters whose primary objective in hunting is to obtain the meat; (3) Trophy Hunters whose primary objective is to harvest a trophy bull elk and test their hunting skills; (4) "Outdoorsmen" that rate being in the out doors and solitude as the most important reasons for hunting. For a more detailed description of the clusters see Allen (1988).

Economic Analysis of Each Grouping

The first step in performing the analysis was to create four data sets that contained hunters belonging to the respective cluster. Then separate logit equations were estimated and benefits calculated for both the logit equation and the open-ended willingness to pay questions. The number of hunters in each cluster is as follows: Cluster 1=331, Cluster 2=255, Cluster 3=253 and Cluster 4=676.

Statistical Results

Table 13 presents the logit equations for each cluster for the three valuation scenarios: current conditions, double chances of harvesting a 6pt or better elk and reduce the number of other hunters seen in half.

Table 13a. Logit equations for Montana elk, by cluster, current conditions (t-statistics in parentheses).

Cluster	Const.	LCRBID	LTRIPS	LINCOME	LELKSEEN	LHTRSEEN
1	-3.8786	-0.6202	-0.021	0.638	0.0985	
	(-2.17)	(-5.90)	(-0.28)	(3.59)	(2.34)	
2	0.7683	-0.7941	-0.2863	0.2065	0.1493	0.1084
	(0.36)	(-5.49)	(-2.73)	(1.04)	(3.03)	(1.32)
3	-1.2231	-0.5648	-0.2911	0.3834	0.0862	
	(-0.66)	(-4.45)	(-2.22)	(2.20)	(1.97)	
4	-1.7571	-0.7623	-0.2378	0.5012	0.1554	
	(-1.44)	(-9.46)	(-3.73)	(4.22)	(5.62)	

Table 13b. Double chances of harvesting a six-point or larger elk (t-statistics in parentheses).

Cluster	Const.	LBULBID	LTRIPS	LINCOME	LELKSEEN	LHTRSEEN
1	-0.7953	-0.8558	-0.1134	0.5193	0.0425	
	(-0.45)	(-6.71)	(-1.42)	(3.01)	(1.04)	
2	3.9758	-0.9793	-0.0256			0.0913
	(6.09)	(-6.97)	(-0.26)			(1.25)
3	2.7673	-1.1444	-0.3135	0.3605	0.0837	0.0681
	(1.29)	(-6.93)	(-2.15)	(1.81)	(1.79)	(1.01)
4	-0.0346	-0.7431	-0.1696	0.3582	0.0693	0.07623
	(-0.03)	(-8.84)	(-2.74)	(3.16)	(2.66)	(2.00)

Table 13c. Reduce number of elk hunters seen by half (t-statistics in parentheses).

Cluster	Const.	LCWDBID	LTRIPS	LINCOME	LELKSEEN	LHTRSEEN
1	-1.8796	-0.9637	-0.1014	0.609	0.1659	
	(-1.04)	(-7.13)	(-1.28)	(3.34)	(3.77)	
2	2.416	-0.9916	-0.0752	0.1493	0.048	0.1154
	(1.27)	(-6.82)	(-0.74)	(0.84)	(1.10)	(1.54)
3	0.3834	-0.8705	-0.0545	0.3803	0.0622	
	(0.21)	(-6.54)	(-0.42)	(2.13)	(1.41)	
4	-0.1924	-0.8637	-0.1731	0.3912	0.112	0.0681
	(-0.16)	(-9.81)	(-2.73)	(3.33)	(4.07)	(1.71)

As can be seen in Table 13, all of the coefficients on bid amount (CRBID, BULBID, and CWDBID) are significant at the 99% level. Most of the other variables were significant at the 90% level or better. The signs of the variables are generally as expected. The probability of paying a higher trip cost increased with income and number of elkseen. In Table 13c, the willingness to pay to reduce the number of hunters seen by half, goes up as the number of other hunters seen on this trip increased. That is, the more crowded it was, the more hunters were willing to pay to reduce crowding.

Benefit Estimates by Group and Comparison of Different Hunter Groupings

Table 14 presents the net willingness to pay of elk hunters in each of the four clusters. Figures 5 and 6 present a comparison of elk hunter benefits under current condition and double chances of harvesting a six-point elk.

Table 14. Economic values by Montana elk hunter preference clusters.

Cluster 1: "Multiple Experience Hunter"

	Current Condition	Bigger Elk	Diff.	1/2 Crowds	Diff.
MEAN-LOGIT:	$300.45	$380.40	$79.95	$258.96	($41.49)
MEAN-OE.CVM:	$105.49	$126.40	$20.91	$96.12	($9.37)
MEDIAN-LGT:	$78.67	$178.24	$99.57	$101.35	$22.68

Cluster 2: "Meat Hunter"

	Current Condition	Bigger Elk	Diff.	1/2 Crowds	Diff.
MEAN-LOGIT:	$164.78	$195.37	$30.59	$181.48	$16.70
MEAN-OE.CVM:	$64.09	$83.74	$19.65	$74.44	$10.35
MEDIAN-LGT:	$35.11	$68.81	$33.70	$61.57	$26.46

Cluster 3: "Trophy Hunter"

	Current Condition	Bigger Elk	Diff.	1/2 Crowds	Diff.
MEAN-LOGIT:	$360.32	$445.76	$85.44	$343.35	($16.97)
MEAN-OE.CVM:	$110.95	$167.28	$56.33	$137.59	$26.64
MEDIAN-LOGIT:	$113.50	$305.53	$192.03	$151.20	$37.71

Cluster 4: "Outdoorsmen"

	Current Condition	Bigger Elk	Diff.	1/2 Crowds	Diff.
MEAN-LOGIT:	$248.01	$346.98	$98.97	$249.54	$1.53
MEAN-OE.CVM:	$91.98	$113.02	$21.04	$97.39	$5.41
MEDIAN-LOGIT:	$72.27	$135.22	$62.94	$84.95	$12.67

All Clusters Combined

	Current Condition	Bigger Elk	Diff.	1/2 Crowds	Diff.
MEAN-LOGIT:	$262.31	$345.44	$83.13	$258.69	($3.62)
MEAN-OE.CVM:	$93.61	$119.89	$26.28	$99.13	$5.52
MEDIAN-LOGIT	$72.27	$135.22	$62.94	$84.95	$12.67

KEY: MEAN LOGIT = The truncation is set at the maximum bid of $1,100.
MEAN-OE.CVM = Mean of the hunter's willingness to pay.
MEDIAN-LGT = The median is calculated as EXP (-CONSTANT / VAR.COEFF.).

As Figures 5 and 6 indicate, Trophy hunters (Cluster #3) have the highest values for elk hunting. This pattern is true whether one looks at the mean from the logit model or the open-ended CVM.

Figure 7 presents the incremental willingness to pay for double chances of harvesting a 6pt or larger bull elk. All types of hunters value the opportunity to double chances of harvesting a six-point bull elk. Focusing on the logit mean values, the trophy hunters and the "outdoorsmen" (cluster #4) have the highest increase in willingness to pay for doubling chances of harvesting a six-point or larger bull elk. Focusing on the open-ended willingness to pay value, the trophy hunters have the largest increase in value, with outdoorsmen, meat hunters and "multiple experience hunters" all about equal in terms of their increase in value.

Figure 8 illustrates the relationship between additional willingness to pay and reducing the number of hunters seen by one-half. The outdoorsmen (cluster #4), who ranked solitude as their second most important trip attribute, has a small but positive willingness to pay for reduction in crowding. However, meat hunters have the highest additional willingness to pay for reduction in crowding. Using the open-ended CVM approach, three out of the four clusters appear to derive benefits from reduced crowding. However, most elk hunters do not seem to derive significant benefits from reducing crowding in the Hunt Areas analyzed in Montana. Note that changes in willingness to pay of less than $10-20 do not likely represent statistically significant changes. This could be due to the fact that elk hunters in Montana do not see many other hunters. Specifically, elk hunters indicated in the survey they saw about 10-20 other hunters on a 6.5 day hunting trip or about 2 hunters per day. At this low rate, it is not too surprising that hunters are not willing to pay to reduce the number of other hunters in half. A comparison to California deer hunters is underway to determine if and how much willingness to pay rises as the number of others seen increases.

In general, stratification of hunters by primary motivation or type of elk hunting experience desired provided some additional insight into the make up of the overall sample willingness to pay values. Specifically, the average value reflects different levels of benefits that vary systematically between different types of hunters. Resource management actions (timber harvesting, roading, livestock grazing) and hunting regulations may affect these different groups of hunters in different ways. These differential affects should be kept in mind when performing impact analyses of resource management actions or hunting regulations.

FIGURE 5

WILLINGNESS TO PAY
CURRENT CONDITIONS

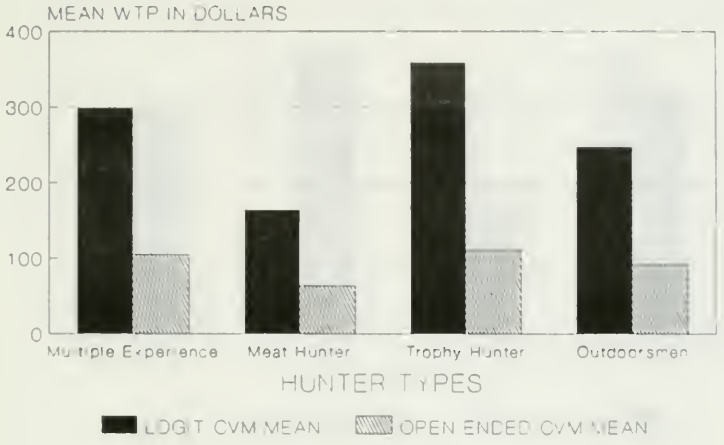


FIGURE 6

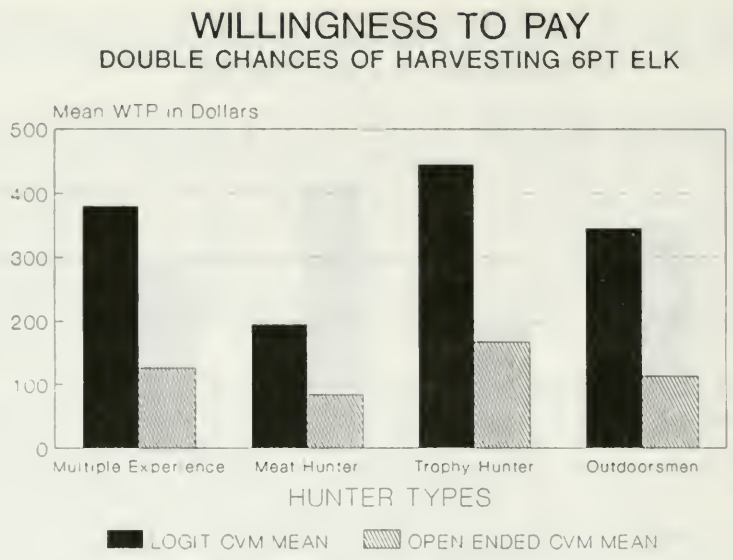

WILLINGNESS TO PAY
DOUBLE CHANCES OF HARVESTING 6PT ELK
Mean WTP in Dollars
500
400
300
200
100
0
Multiple Experience
Meat Hunter
Trophy Hunter
Outdoorsmen
HUNTER TYPES
LOGIT CVM MEAN
OPEN ENDED CVM MEAN

FIGURE 7

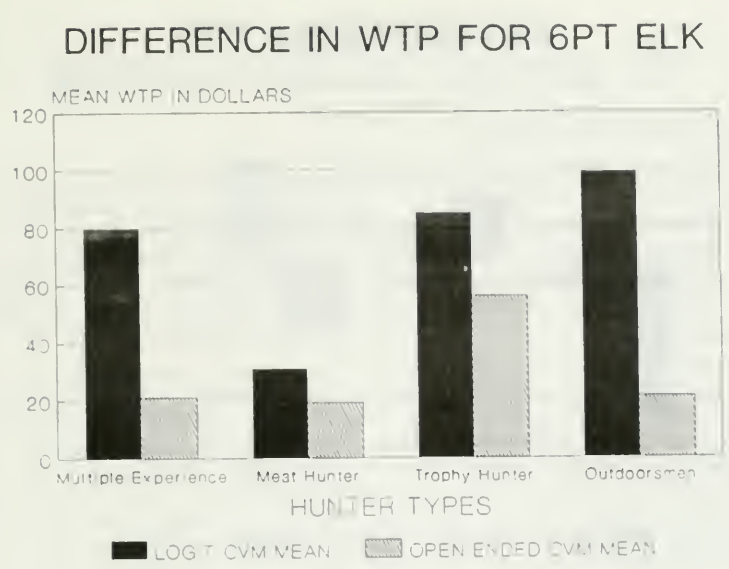
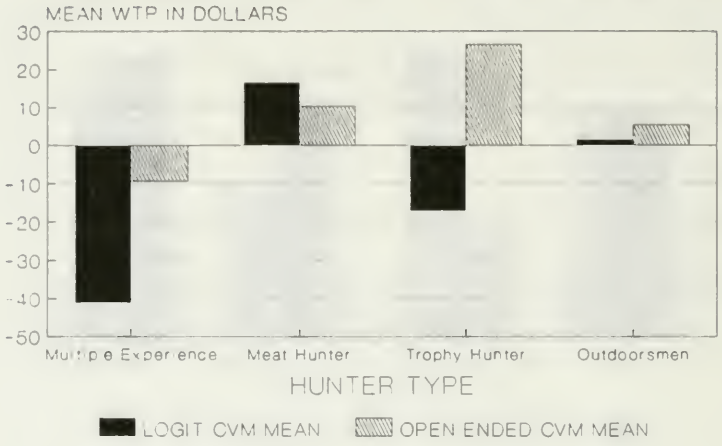

DIFFERENCE IN WTP FOR 6PT ELK
MEAN WTP IN DOLLARS
120
100
80
60
40
20
0
Multiple Experience
Meat Hunter
Trophy Hunter
Outdoorsman
HUNTER TYPES
LOG T CVM MEAN
OPEN ENDED CVM MEAN

FIGURE 8

DIFFERENCE IN WTP TO SEE HALF AS MANY HUNTERS



CHAPTER VII

CONCLUSION

The current value of elk hunting was successfully estimated using the Contingent Valuation Method. In addition, the change in value of elk hunting was estimated for doubling chances of harvesting a 6pt or larger bull elk and for reducing the number of other hunters seen in half. These scenarios were valued for five Regions and for 18 Hunt Areas in Montana. The Hunt Areas contained nearly 70 Hunt Districts.

At the State level, the value of current elk hunting conditions is $262 per trip. That is, elk hunters would be willing to pay an additional $262 per trip for the opportunity to hunt elk in their current Hunt Area. This value increases to $345 per trip if the chances of harvesting a 6pt or larger bull elk doubled. The current value of $262 does not increase significantly for reducing by one half the number of other elk hunters seen. This may be due to the currently low number of other elk hunters seen per day in Montana. The value per hunter day under current conditions is $39.90 per day or $62 per 12-hour Recreation Visitor Day.

This study also measured the economic value of elk hunting by hunter preference type. Four preference types were defined relative to primary motivations for deer hunting. These motivations included the importance of being in the out-of-doors, solitude, harvesting a trophy elk, being in a natural setting, etc.. The net economic values or willingness to pay did vary substantially by hunter preference type or cluster. The valuation by hunter type demonstrated that there can be a substantial amount of variation in the mean values: trophy elk hunters place very high values on elk hunting opportunities ($360 per trip) while other hunter types placed much lower values ($164 per trip).

We expect the value of improving opportunities to harvest a trophy elk would be worth significantly more to one hunter type than another. This pattern is evident using the willingness to pay amounts derived from both the open-ended contingent valuation questions and the dichotmous choice contingent valuation questions.

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APPENDIX A

SURVEY INSTRUMENT

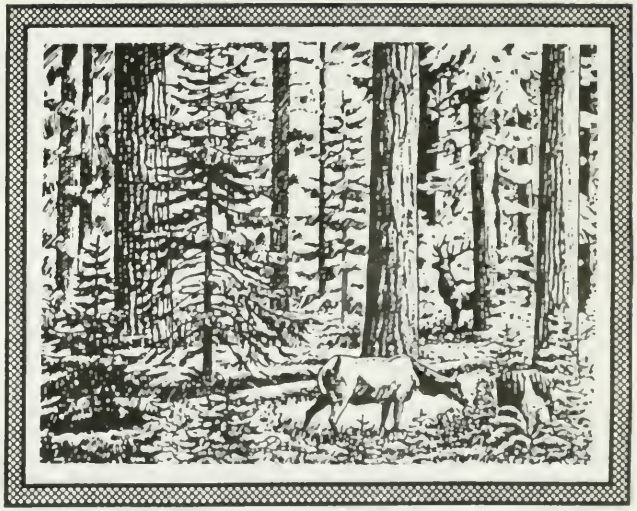
Thank you for your help. Is there anything else you'd like to tell us about hunting in this area? We would appreciate any comments.

Thanks again. If you would like to receive a copy of the survey results, please write "Results requested" and your address on the back of the return envelope (not on this questionnaire).

MONTANA

ELK HUNTING SURVEY

1986



Montana Department of Fish, Wildlife & Parks

I. FIRST, WE HAVE SOME GENERAL QUESTIONS ABOUT YOUR HUNTING.

1. How many years have you been hunting elk? _____ Years

2. About how many days per year do you hunt elk? _____ Days

3. How many of these days are spent in Montana? _____ Days

4. How would you rate elk hunting compared to your other outdoor recreation activities? (please check one)

___ It's my favorite outdoor recreation activity

___ It's one of my favorite outdoor recreation activities

___ It's just one of several outdoor recreation activities that I do

___ I prefer other outdoor recreation activities

II. THE NEXT QUESTIONS ASK ABOUT YOUR MOST RECENT ELK HUNTING TRIP IN MONTANA DURING THE GENERAL SEASON.

1. Approximate dates(s) of this last trip: _____

(A trip could be anything from an hour to several or more days)

2. Use the map provided to show what HUNTING AREA you visited on this trip. (If you hunted in more than one area, write the number of the ONE area where you spent the most time)

Number of hunting area (from map on back of the cover letter): _____

IN ALL OF THE FOLLOWING QUESTIONS, "THIS AREA" MEANS THE AREA WHOSE NUMBER YOU JUST LISTED.

3. On this trip, how many days did you hunt in this area?

___ Days

4. About how many hours per day did you hunt? ___ Hours

5. About how many elk did you see while hunting in this area?

___ Elk seen in this area

6. Did you kill an elk in this area? ___ Yes ___ No

7. If yes, what kind did you get?

___ Antlered ___ Antlerless

If your elk was antlered, how many points did it have on each side?

Points on side 1: _____ Points on side 2: _____

7a. District number where elk was killed (from map): ____

8. Did you get any other big game in this hunting area?

___ Yes ___ No

9. If yes, what species did you shoot?

___ Mule deer ___ Bear

___ White-tailed deer ___ Other: _____

10. Was this area the only place you hunted on this trip, or did you hunt in other areas listed on the map? (Please check one)

___ This area was the main or only one I hunted on this trip away from home

___ This area was one of several areas I hunted in on this trip

11. If you did hunt in other areas on this trip, please list the area numbers from the map:

_____

12. What type of equipment did you use in this area? (please check all that apply)

___ Muzzle loader ___ Rifle ___ Bow and arrow

13. Did you hire a hunting guide or outfitter in this area?

___ Yes ___ No

14. Was hunting the main purpose of your trip away from home when you hunted in this area or did you make the trip for other reasons such as business or a family vocation? (please check one)

___ Hunting was the main purpose of this trip

___ Hunting was one of several reasons for making the trip

15. Which of the following items did you use while hunting in this area? (please check all items you used)

___ Dirt bike or ATV
___ Horse
___ Binoculars
___ Topographic map
___ Backpacking tent
___ Trailer
___ Wall tent
___ Snowmobile
___ Elk bugle
___ Camera
___ Spotting scope
___ Motor home

16. About how far did you walk while you were hunting in this area? (please use an average if you hunted more than a day)

___ miles

17. About how many other hunters (not in your party) did you see while you were hunting this area on this trip?

___ Other hunters

18. Was this number of hunters: (please check one)

___ More than I expected to see

___ About as many as I expected to see

___ Fewer than I expected to see

___ I didn't have any expectations

19. Did the other hunters present affect your enjoyment of the hunting in this area?

___ Yes ___ No

20. If yes, please explain how:

21. Was this the first time you hunted in this particular area?

___ Yes ___ No, I've hunted here before

22. If No, how many years have you been hunting in this area?

_____ Years

23. How does this area rate compared to other areas in Montana? (please check one)

___ It's my favorite place to hunt

___ It's one of my favorite places to hunt

___ It's one of many places where I hunt

___ I prefer to hunt other places

24. For hunting purposes, do you feel the number of roads to vehicle use in this area is: (please check one)

___ Too few

___ About right

___ Too many

25. In the last few years, has the number of open roads in this area increased, decreased, or stayed the same? (check one)

___ Number of open roads in this area has increased

___ Number of open roads in this area has decreased

___ Number of open roads in this area is the same

___ I'm not sure

26. For game retrieval purposes, how do you feel the existing roads in this area should be managed? (please check one)

___ Hunters should be allowed to use only open roads to retrieve game with a vehicle

___ Hunters should be allowed to use closed roads to retrieve game with a vehicle

___ Hunters should be allowed to use vehicles off roads to retrieve game

27. How many separate trips did you make from your home to this hunting area this season?

___ Separate trips from home this year

28. About how frequently do you plan to hunt in this area in the future? (please check one)

___ As frequently as I do now

___ More frequently than I do now

___ Less frequently than I do now

29. Are there any other hunting areas in Montana that you feel provide a hunting experience comparable to the this particular area?

___ Yes ___ No

30. If yes, please list the numbers of any other comparable hunting areas from the map:

_____

31. Suppose you were told you could not hunt elk in this area on this trip. What other area might you have hunted instead?

Please specify area number from map: _____

32. About how far is it from your home to this alternative hunting location?

___ Miles

33. How does it compare to hunting where you did?

14. People hunt for many reasons. We'd like to know some of the reasons you hunted this area on this trip, to help us understand different types of hunters and their preferences.

Following is a list of possible reasons for hunting. Please check the box that says whether that reason was very important, important, not important, or not at all important a reason you hunted in this particular area on this trip.

	Very Important	Important	Not very Important	Not at all Important	Not Sure
1. Good road access	☐	☐	☐	☐	☐
2. For the solitude	☐	☐	☐	☐	☐
3. Because there are lots of elk there	☐	☐	☐	☐	☐
4. To test my hunting skills	☐	☐	☐	☐	☐
5. It's close to home	☐	☐	☐	☐	☐
6. To get a trophy elk	☐	☐	☐	☐	☐
7. To be outdoors	☐	☐	☐	☐	☐
8. I've had good hunting here	☐	☐	☐	☐	☐
9. For the meat	☐	☐	☐	☐	☐
10. To view the scenery	☐	☐	☐	☐	☐
11. Because I had a special permit for the area	☐	☐	☐	☐	☐
12. To be in a natural setting	☐	☐	☐	☐	☐
13. To hunt with family members	☐	☐	☐	☐	☐
14. It's where my friends were going	☐	☐	☐	☐	☐
15. To get away from other hunters	☐	☐	☐	☐	☐
16. To be in rugged country	☐	☐	☐	☐	☐

17. Could you please look back over this list and circle the numbers of the three most important reasons you hunted in this area on this trip?

III. THE NEXT FEW QUESTIONS WILL HELP US TO UNDERSTAND THE VALUE YOU PLACE ON HUNTING IN THIS AREA.

WE REALIZE YOU AREN'T USED TO CONSIDERING HUNTING THIS WAY, BUT PLEASE THINK ABOUT IT AND GIVE US YOUR BEST ESTIMATE!

1. About how far is it from your home to where you hunted in this area on this trip?

_____ Miles (one-way)

2. How long did it take to travel from your home to this area?

___ Hours (include any stops made en route)

3. If you drove, how many other hunters were in the vehicle?

___ Number of other hunters

4. About how much did you personally spend on this trip? If you can't recall the exact amount, please give your best estimate for each of the following three types of expenses.

_____ Amount I spent for transportation (gas, car rental, airfare and any other transportation costs)

_____ Amount I spent on food, beverages, and lodging

_____ Amount I spent on equipment purchased just for this trip, access or guide fees, and all other expenses

_____ TOTAL AMOUNT I SPENT ON THIS HUNTING TRIP

5. Was this trip worth more than you actually spent?

___ Yes ___ No

6. If YES, would you still have made the trip if your share of the expenses had been $400 more?

___ Yes ___ No

7. What is the maximum increase in your actual trip cost you would have paid to hunt this specific area instead of hunting elsewhere?

_____ Dollars

8. If your answer was zero, could you briefly explain why?

9. Imagine that everything about this last trip were the same, except that your chance of getting a 6-point or better bull elk was twice as great AND that your trip costs were $350 more than your actual costs. Would you still have made the trip under these circumstances? (please check one)

___ Yes, I would still have made the trip

___ No, I would not have made the trip

10. What is the maximum increase in actual trip costs you would pay to double your chances of getting a 6-point or better bull elk?

_____ Dollars increase in trip cost

11. If your answer was zero, could you briefly explain why?

12. Imagine that everything about this last trip were the same, except that you saw half as many hunters as you actually did AND your trip costs were $400 more than they actually were. Would you still have made the trip under these circumstances? (please check one)

___ Yes, I would still have made the trip

___ No, I would not have made the trip

13. What is the maximum increase in actual trip costs you would pay to reduce by half the number of hunters you saw while hunting in this area?

_____ Dollars increase in trip cost

14. If your answer was zero, could you briefly explain why?

IV. THE NEXT FEW QUESTIONS ASK YOUR OPINION ON DIFFERENT STATEWIDE HUNTING MANAGEMENT OPTIONS.

1. Managing for a diversity of opportunities to hunt elk may require more hunting regulations. However, these regulations would restrict your hunting opportunities. We'd like to know your opinions on the following types of potential regulations to maintain a diversity of hunting opportunities in Montana

For each regulation, circle the answer showing whether you favor that regulation, do not favor it but would accept it if necessary, do not find the regulation acceptable, or would need more information to decide.

A. No special permit to hunt bull elk would be needed. There would be considerable competition for bull elk but no restrictions other than having a license. You could hunt every year but your odds of getting a bull would be less than 1 in 10. Please circle one:

Favor	Do not favor but would accept it	Would not accept it	Would need more information

B. An unlimited number of bull elk permits would be available. You would be able to get a permit every year but you would have to choose the one district where you would hunt and not be able to hunt in any other districts. Please circle one:

Favor	Do not favor but would accept it	Would not accept it	Would need more information

C. A limited number of bull elk permits would be available through a drawing in June. You would have to choose the one district where you would hunt and not be able to hunt in any other districts. You might get a permit only once every 5 years, but if you did obtain a permit you would have a much better chance (than 1 in 10) of getting a bull. Please circle one:

Favor	Do not favor but would accept it	Would not accept it	Would need more information

D. The taking of bull elk would be subject to point regulations. Hunters could shoot only bulls that had at least one antler with 2 or more points. Please circle one:

Favor	Do not favor but would accept it	Would not accept it	Would need more information

E. The taking of bull elk would be subject to point regulations. Hunters could shoot only bulls that had at least one antler with 5 or more points. Please circle one:

Favor	Do not favor but would accept it	Would not accept it	Would need more information

F. To reduce pressure on bulls, antlerless elk permit holders would be allowed to hunt only antlerless elk and only in the hunting district where their permit was valid. Please circle one:

Favor	Do not favor but would accept it	Would not accept it	Would need more information

V. THESE LAST FEW QUESTIONS WILL HELP US UNDERSTAND YOUR RESPONSES BY KNOWING SOME BASIC INFORMATION ABOUT YOU.

1. Where are you from? City: _____ State: _____

2. What is your age? _____ Years

3. Are you: ___ Male ___ Female

4. Are you a member of any hunting, conservation, or sport organizations?

___ Yes ___ No

5. If so, which ones?

6. What is the highest year of formal education you completed?

___ Some grade school ___ Some college

___ Finished grade school ___ Finished college

___ Finished junior high school ___ Some postgraduate work

___ Finished high school ___ Finished postgraduate

7. If you had not gone hunting this trip, would you have been working instead?

___ Yes ___ No

8. During the hunting season this year, were you: (check one)

___ Employed full time ___ Retired

___ Employed part time ___ Homemaker

___ Unemployed ___ Other: _____

9. Please check your household's income before taxes last year:

___ Under 5,000 ___ 20,000 - 24,999 ___ 40,000 - 49,000

___ 5,000 - 9,999 ___ 25,000 - 29,999 ___ 50,000 - 74,999

___ 10,000 - 14,999 ___ 30,000 - 34,999 ___ 75,000 - 100,000

___ 15,000 - 19,999 ___ 35,000 - 39,999 ___ over 100,000